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EFFECTS OF CW-396A RIGID RADOME ON AN/FPS-6 PERFORMANCE

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NOX

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Project 5579

Task 45384

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ABSTRACT

At a number of radar installations, a considerable degree of high angle clutter is apparent on the range height indicator of the AN/FPS-6 radar system when covered by a CW-396A rigid radome. A description of the nature and source of the clutter along with steps taken to alleviate it is presented. Theoretical corroboration is given for the results obtained during a series of tests on the AN/FPS-6 with the CW-396A radome.

PUBLICATION REVIEW

This report has been reviewed and is approved.

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TABLE OF CONTENTS

Contents *Page*

LIST OF ILLUSTRATIONS

EFFECTS OF CW-396A RIGID RADOME ON AN/FPS-6 PERFORMANCE *

INTRODUCTION

In the fall of 1959 an operational radar installation in Europe reported severe clutter problems on an AN/FPS-6 radar system covered by a CW-396A rigid radome. This clutter manifested itself out to 50 miles in range and extended to the full elevation of the RHI scope. A strong correlation was also observed between the existence of ground clutter on the PPI presentation and that on the RHI presentation. For a particular azimuth, where no clutter appeared on the PPI, none was apparent on the RHI, and conversely, a high degree of clutter on the PPI repeated itself at high angles on the RHI.

The CW-396 radomes have been installed over AN/FPS-6 antennas since 1955 with no known reports of such difficulties appearing in their monthly checklists or elsewhere. Therefore, the trouble was assumed not to be due to the radome, but to some malfunctioning of the radar system itself. This assumption was later proven incorrect, but at the time it seemed the only logical explanation.

In November 1959, a team of General Electric engineers performed a number of tests at the European installation to ascertain the cause of the trouble. Information obtained from operating personnel at the site was inconclusive as to whether or not the clutter was present prior to installation of the radome. A thorough set of measurements, both mechanical and electrical, were taken on the system. No malfunctioning was observed and set operation was found perfectly normal and within the requirements prescribed by applicable Technical Orders.

Subsequent to this test, a query was sent to several AC&W Squadrons requesting information as to whether similar difficulties were being experienced at other sites. Early in 1960 a reply was received from each site reporting no observed changes in radar performance as a result of the radome installation. However, after a visit by the Squadron Radar Maintenance NCO, two sites were reported as having false permanent echoes ranging from 0 to 40 miles at most azimuths and varying in altitude up to the maximum altitude presentation on the RHI.

Since the sites reporting difficulty were overseas installations, it was requested that Air Defense Command provide a suitable site within the continental United States for tests to determine the source of the problem. A site on the West Coast, which was also experiencing these difficulties, was selected. Examination of the RHI photographs taken

* Released 9 August 1961.

at the site clearly indicated that the clutter was as intense, if not worse than that experienced at the European site. Since that time, a number of other sites in the United States have also reported similar difficulties.

The purpose of this report is to describe the nature and source of the high angle clutter problem associated with the AN/FPS-6 radar system when using a CW-396A rigid radome. A discussion of the corrective action which has been taken and is being planned to solve the problem is presented and theoretical corroboration is given to support the data available from the various tests which have been conducted during the course of the investigation.

EFFECTS OF RADOME CW-396A ON AN/FPS-6 OPERATIONAL PERFORMANCE

Figures 1, 2 and 3 are some representative RHI photographs taken at the West Coast site. Figure 1 is a photograph of the system using a CW-396A radome; the range is 100 miles. As can be appreciated, the indentification of a target in this clutter would be extremely difficult if at all possible. Figure 2 is a picture of the same system; this time, however, the STC capability of the system is being used. The flat time of the STC pulse is approximately 500 microseconds and affords around 25 db attenuation to the received signal. As can be seen this clears up the RHI presentation to a considerable degree and since the full sensitivity of the receiver is not necessary to detect close-in targets, it does not severely hamper the acquisition function of the radar system. Figure 3 is a photograph of an adjoining AN/F PS-6 system which does not use a radome. It can be seen that this system is relatively clear of high angle clutter.

In an effort to determine the relative magnitude of this clutter, an attenuator was placed in the IF strip and RHI photographs were taken with various degrees of attenuation inserted. Representative photographs are shown in Figure 4. It should be noted that the clutter appearing on the RHI decreases in elevation as the magnitude of the attenuation increases, indicating clearly that the magnitude of the false echoes decreases with elevation angle.

A photograph of the PPI at this same site is shown in Figure 5. The range is 100 miles. It can be seen that this is a site having a great deal of ground clutter to begin with, more than likely aggravated by the fact that the location of the site is between two ranges of mountains.

For comparison, photographs of the RHI and PPI were also taken at a site on the East Coast having both an uncovered and a covered AN/FPS-6. The location of this site is such that the surrounding area is, for the most part, flat. From the PPI photograph, Figure 6, it can be seen that this site is relatively free from ground clutter. The maximum range in both photographs was 50 miles. The RHI photographs show none of the clutter observed at the West Coast site. A comparison of the two sites clearly indicates that it is a combination of radome and terrain conditions which gives rise to the high angle clutter problem.

EFFECTS OF RADOME PARAMETERS ON ANTENNA PATTERNS

In a space fram type of radome there are essentially only three parameters which give rise to a loss in antenna gain and, in two of the cases, a subsequent rise in side lobe level.

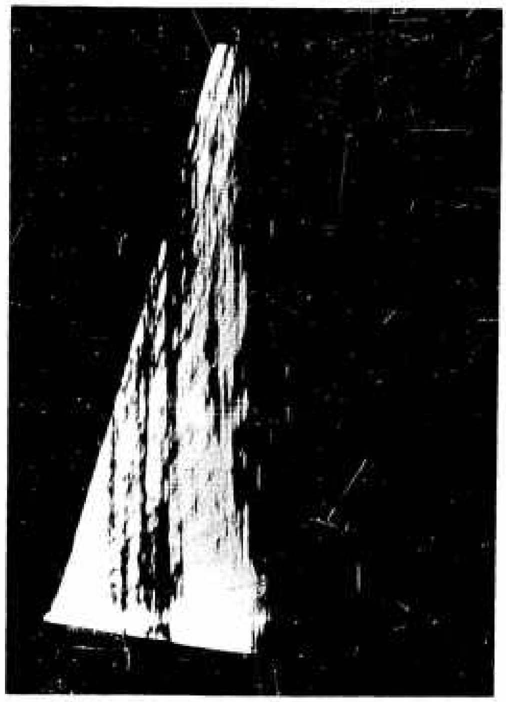


Figure 1. RHI Presentation with CW-396A Radome

Figure 2. RHI Presentation with CW-396A Radome and STC Capability

Figure 3. RHI Presentation - No Radome

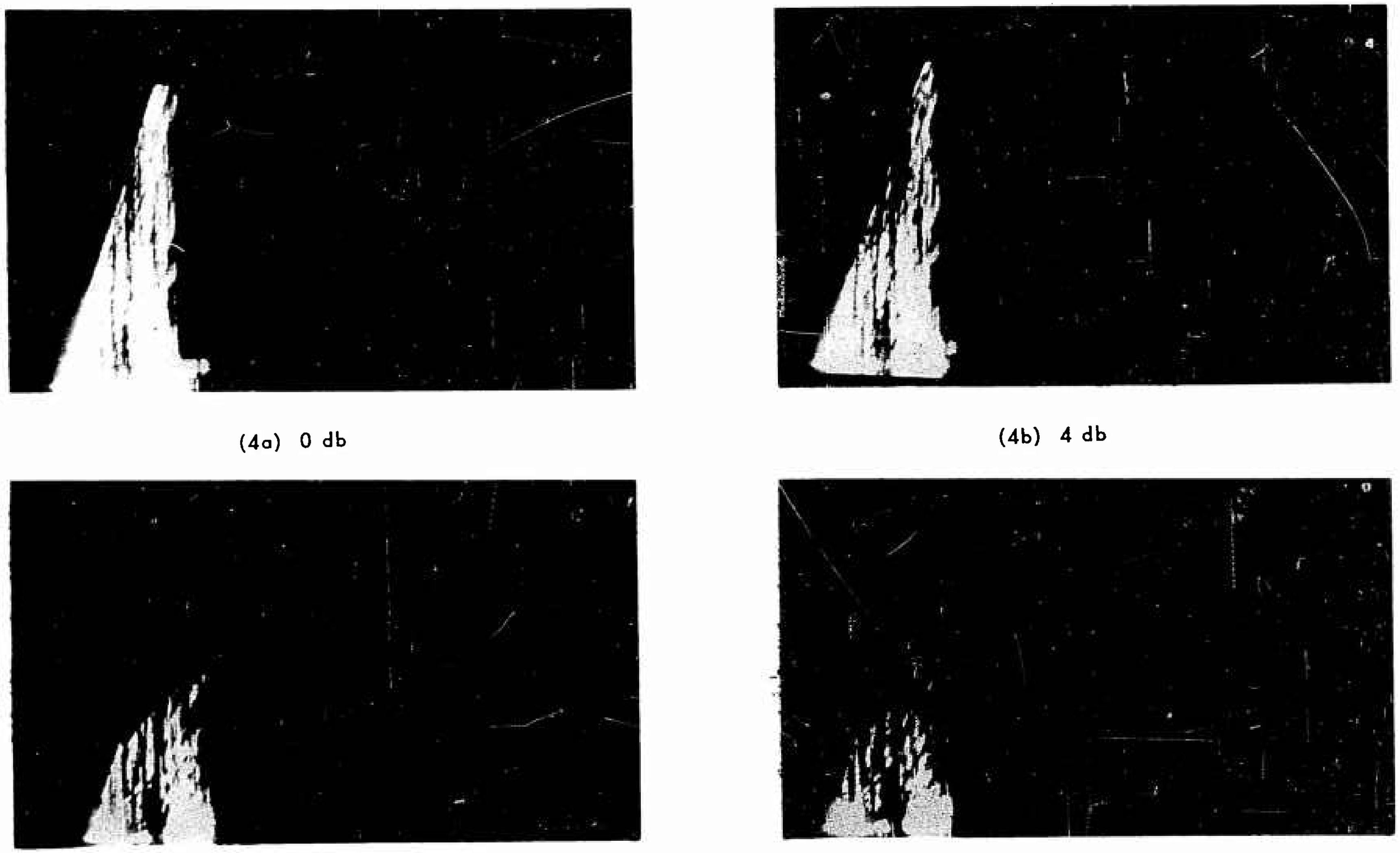
These three parameters are:

Loss Due to Finite Membrane Thickness

The membrane, being characterized by a greater than unity dielectric constant and a finite loss tangent, essentially gives rise to two types of loss mechanism. The first of these is a reflective loss. This loss for the thickness and materials presently employed in the manufacture of space frame radomes is negligibly small. The second is an ohmic type of loss in which the finite loss tangent of the membrane gives rise to a conversion of the microwave energy into thermal energy. This loss is typically of the order of a tenth of a db at S band.

Loss Due to Metal Fasteners

The loss in this case is due to a scattering of the incident energy by the metallic fasteners. The effects of fasteners



(4a) 0 db

(4b) 4 db

(4c) 10 db

(4d) 16 db

Figure 4. RHI Presentation with Various Degrees of Attenuation Inserted

(4e) 26 db

(4f) 32 db

(4g) 50 db

Figure 4. RHI Presentation with Various Degrees of Attenuation Inserted

Figure 5. PPI - West Coast Site

of the size and orientation presently employed can best be described in terms of antenna aperture blocking. The net effect of these fasteners is to reduce the energy in the main antenna lobe and to smear it throughout the antenna side lobe structure.

Loss Due to Structural Members

The structural members comprising a radome can be treated as secondary radiators in which the incident energy from the antenna gives rise to induced currents flowing on or in the ribs. These currents will be either conduction or displacement currents depending upon whether the ribs are metallic or dielectric. The induced currents in turn reradiate this energy in a manner much akin to radiation by a linear antenna. It is this mechanism which gives rise to the greatest loss of antenna gain and to the greatest amount of distortion of the antenna side lobe structure.

The radome skin membrane losses in the CW-396A are so small at S band that they will not be considered further here. In the next two sections of the report, the more serious loss contributions of the metal fasteners and structural members will be considered.

It has been shown,[1, 2] both experimentally and theoretically, that if the percentage of aperture blocked is small, the effect of metallic inclosures such as bolts or fasteners on antenna gain is to reduce this gain in direct proportion to the amount of geometrical antenna aperture blockage. That is to say:

$$E = Eo\left[\frac{A-a}{A}\right], \tag{1}$$

where

Eo is the field strength of main beam,
E is the field strength with obstacles in front of antenna,
A is the antenna aperture area, and
a is the total area of obstacles.

Using this equation and solving for the amount of attenuation due to bolts in the CW-396A a figure of 0.02 db loss is obtained. It can be readily appreciated that this amount of

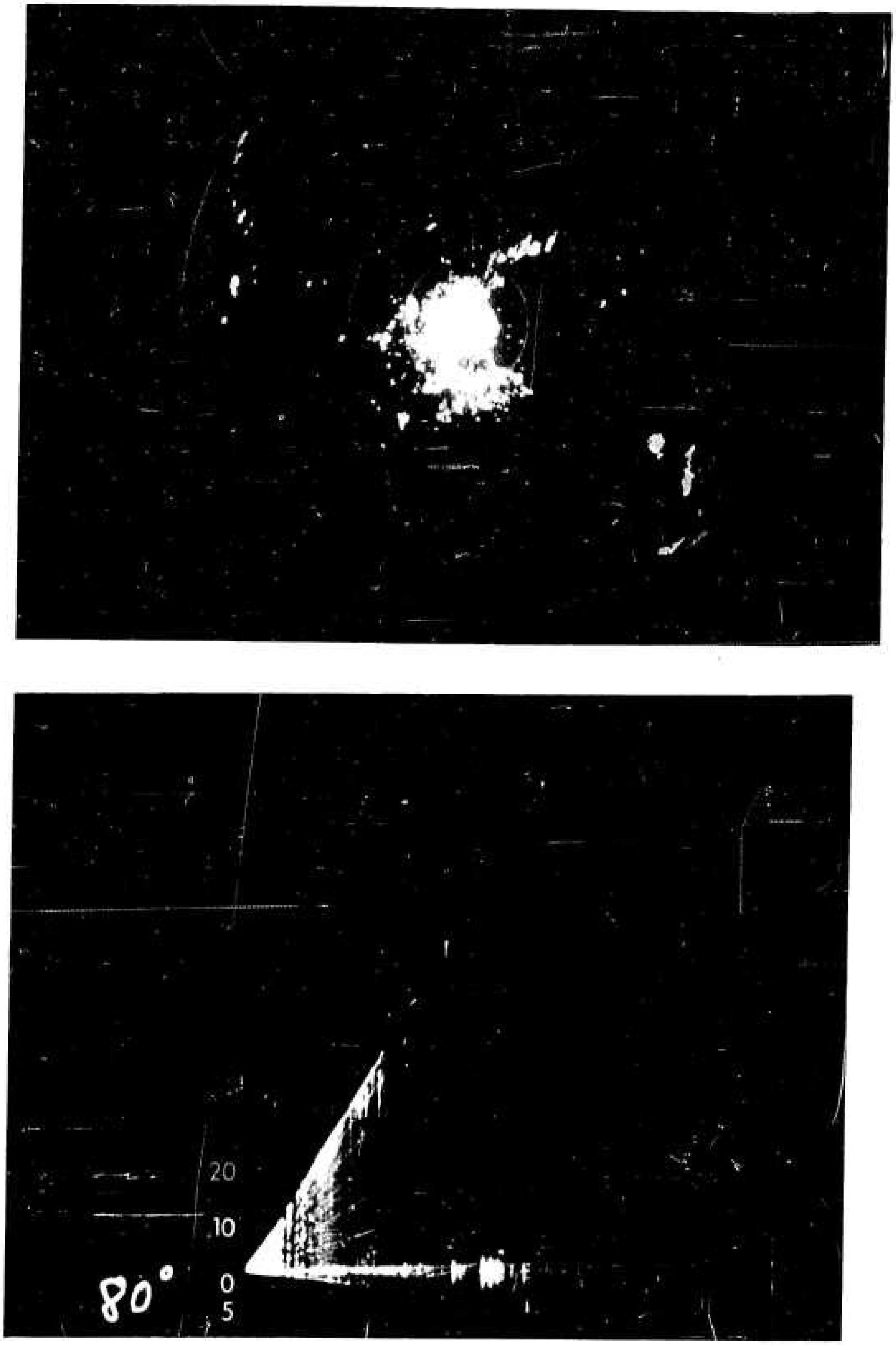


Figure 6. RHI and PPI Presentation - East Coast Site

loss is negligible in comparison to the other losses in the radome. Indeed, if one were to consider that this power, lost by the main beam, were to be reradiated in only one direction, the resultant lobe formed would be about 52 db down from the main beam. In actual practice, due to the fairly random orientation of the bolts, this power loss would more than likely smear itself out into the 4π solid angle, producing an unmeasurable effect upon the antenna radiation pattern.

A study, both theoretical and experimental, of the scattering from small metal obstacles has been conducted by Ohio State University.[3] They have found that the EM scattering from obstacles, the size of the bolts in the CW-396A radome, is, in practice, an unmeasurable quantity. The general conclusion reached in this study is that the effects of small metal objects with size and arrangement typical of the bolts of a reinforced, plastic, geodesic radome are negligible in comparison to the effect of the ribs.

In tests, run several years ago by the General Electric Company [4] on a 20-foot flanged shell radome, deleterious effects upon the close-in side lobes were noted. At first it was presumed that these effects were due to the metallic bolts used in fastening together the radome panels. However, upon replacing these metallic bolts with dielectric bolts, no improvement in antenna performance was noted. Further investigation revealed that the source of the trouble was the large dielectric cap strips which were placed over the flanges for reinforcement purposes.

In a series of tests conducted upon the AN/FPS-6/CW-396A combination at the West Coast site, a number of bolts were removed from an area of the radome which constituted approximately 40 percent of the central portion of the projected antenna aperture area. Subsequent operation of the system revealed no apparent charge in the RHI presentation, indicating that the bolts are an insignificant contributing factor to the repetitive high-angle clutter problem.

It is fairly obvious, then, that both the experimental and analytical evidence indicate that small metallic inclosures of the size and arrangement typically used in large rigid radomes is negligible in comparison with the effect of the ribs. Despite the evidence, however, deleterious radome effects are continually being attributed to the presence of metal bolts.

EFFECTS OF RADOME RIBS

The National Research Council of Canada has performed measurements on the CW-396A[5] radome using an AN/FPS-6 antenna. The main purpose of these tests was to determine the deleterious effects of the radome which give rise to this high angle clutter problem. The test facility that was used is quite well adapted to measurements of this type since it permits erection of about 2/3 of the radome structure thus providing both free space and radome environments at the same time. Also, the radome can be rotated, with respect to the antenna, allowing a determination of insertion loss versus look angle through the radome.

In the first experiment, the radome was rotated in front of the antenna in an effort to

determine the look angle at which the maximum deleterious effects occur. The loss in gain was found to vary between 0.8 db and 1.2 db and to be cyclic, recurring every 18 degrees of rotation. Antenna patterns were taken through the radome at the look angle where vertical-plane scatter side lobes, due to the horizontal set of radome ribs, were found to be at a maximum.

Elevation patterns were then plotted in the following manner. A normal pattern through the peak of the main beam was first plotted and then the antenna was rotated one degree in azimuth and another pattern was taken. This process was repeated every one degree in azimuth for a total coverage of $\pm$ 20 degrees, and the procedure was carried out both with and without the radome in front of the antenna. The subsequent patterns were traced on a sheet of cardboard, cut out and placed on a sheet of plywood thus creating a three dimensional plot of the antenna pattern. Pictures of this plot can be seen in Figures 7 and 8.

As can be seen from the pictures, two families of scatter side lobes are present when the radome covers the antenna. These lobes lie on axes $\pm$ 30 degrees from the horizontal and are spaced about every four degrees along these axes. The largest of these lobes is 22 db below the main beam.

In an effort to provide some theoretical correlation for the tests run by the National Research Council of Canada, calculations were made of the scattering of an array of ribs, using the method described in reference 6, and approximating the geometry of interest here. The CW-396A radome lends itself quite well to such a calculation since the geometry is such that the ribs can be thought of as forming three arrays, one perpendicular to the electric field and the others rotated $\pm$ 30 degrees from the vertical (Figures 9 and 10). Since the radiation from such an array of ribs is essentially contained in a plane perpendicular to the plane of the array, the radiation patterns of the separate arrays will, essentially, be independent of each other. The contribution from the horizontal array will result in raising and/or lowering, dependent upon relative phasing, the existing vertical side lobes while the tilted arrays will essentially radiate into a space which is relatively free of antenna radiation. Therefore, it is only necessary to calculate the radiation from one of the tilted arrays to determine the effect of such an array upon the antenna pattern.

The following approximations and assumptions were used in making the calculation:

. the sperical rib array was replaced by a planar array,

. it was assumed that each rib radiates isotropically in a plane perpendicular to its axis,

. there is no mutual interaction between the ribs, and

. the aperture distribution of the antenna can be approximated by a cosine squared function.

The first and third assumptions have been validated by work done at Ohio State University [7]. The second assumption is valid if the cross section of the rib is small compared to wavelength and the aperture distribution assumed is a typical distribution for a radar antenna.

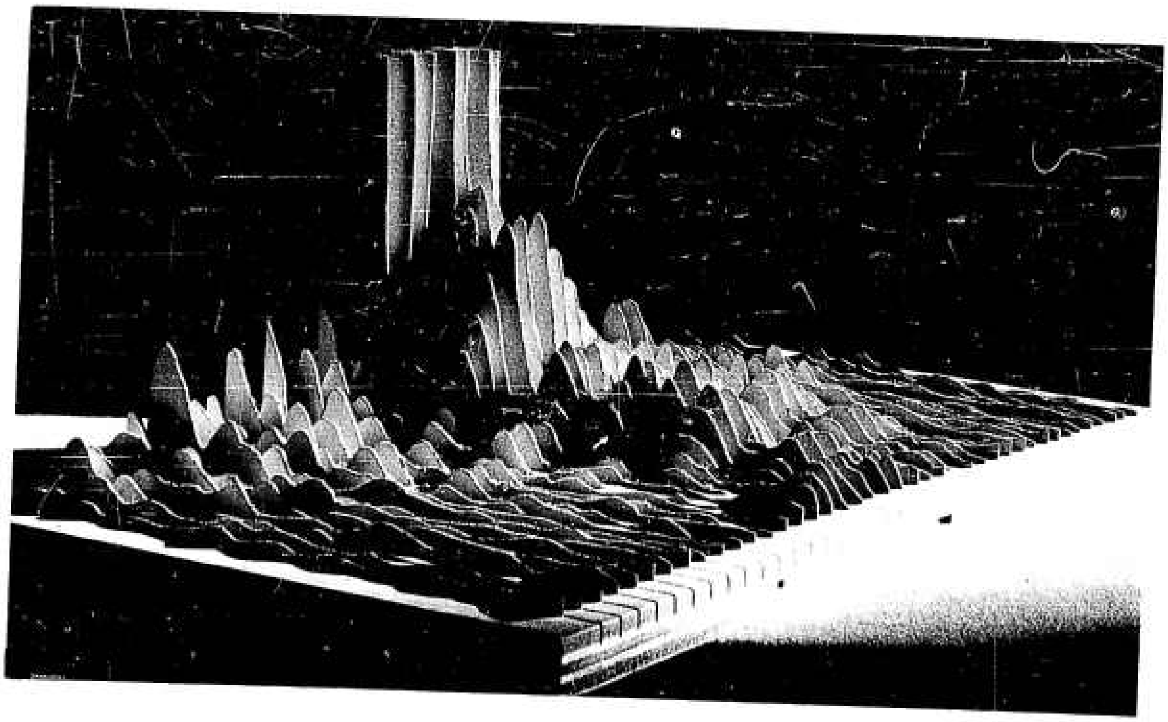


Figure 7. Antenna Pattern of AN/FPS-6 Without Radome

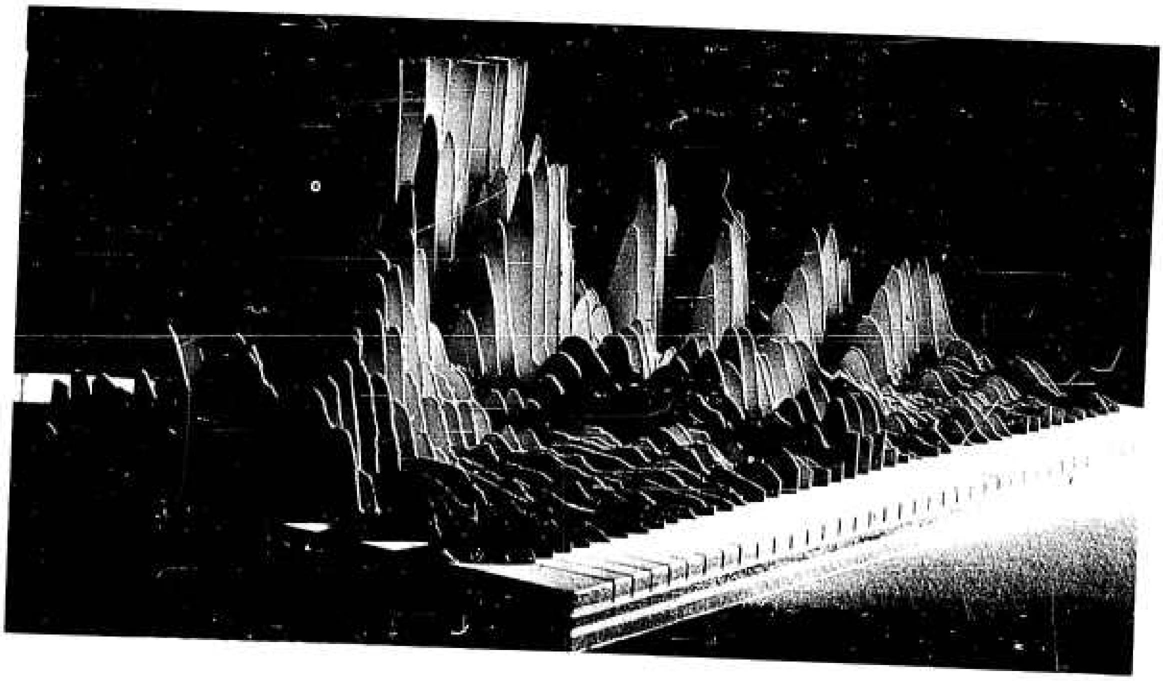


Figure 8. Antenna Pattern of AN/FPS-6 With Radome

As can be seen from Figure 11 only three ribs will be illuminated at one time. Consequently, the far field pattern should take the form of:

$$E = A_o + 2A_1 \cos (kd \sin \phi), \tag{2}$$

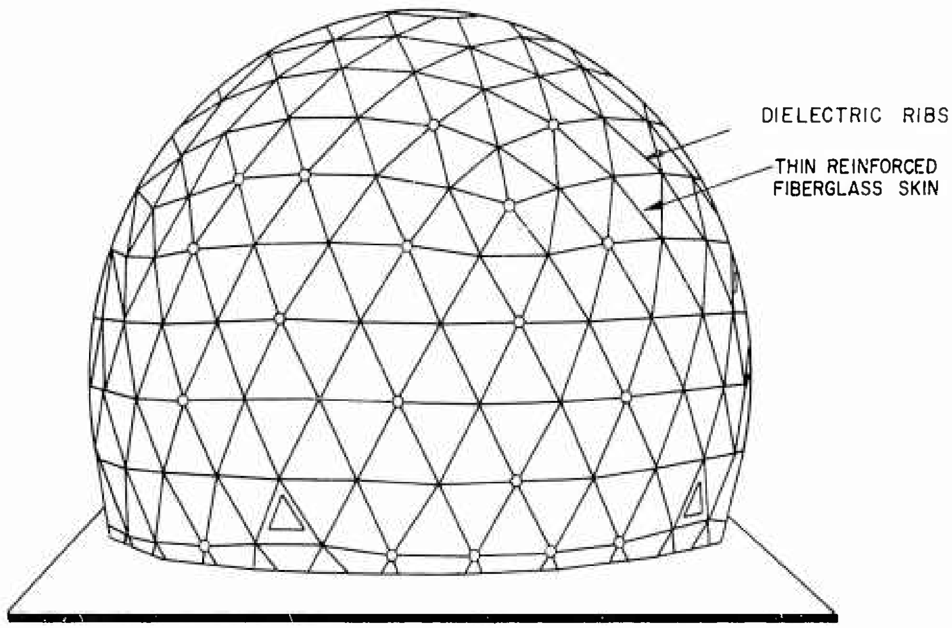


Figure 9. CW-396A Radome Rib Structure

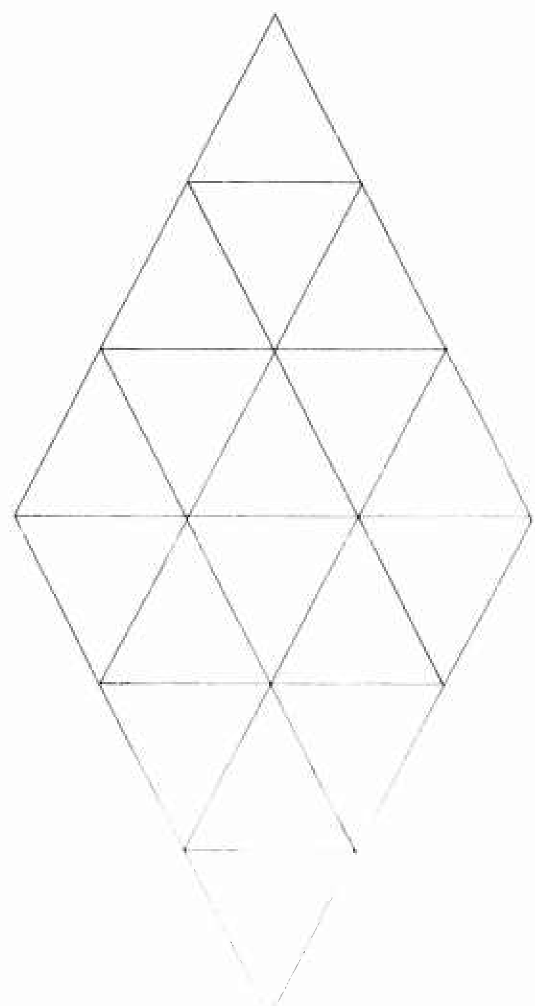


Figure 10. Idealized Array of Radome Ribs

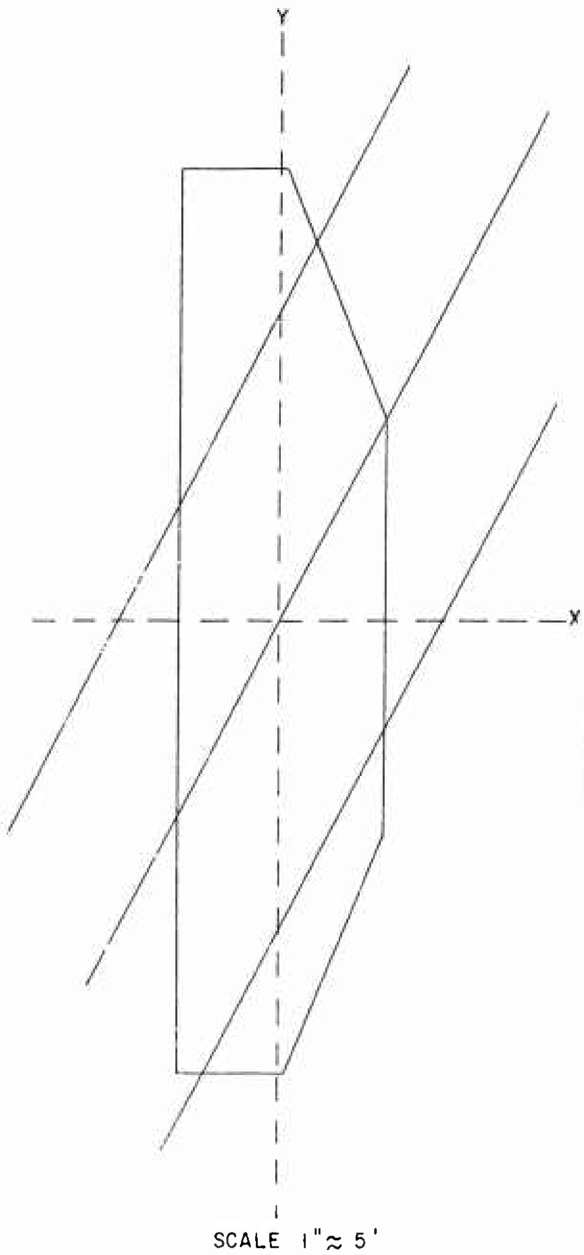


Figure 11. Geometry of Scattering Array with Reference to Antenna

where

Ao is the excitation of middle element,

A is the excitation of two other elements,

k is the wave number $= \frac{2\pi}{\lambda}$,

d is the rib spacing, and

ϕ is the angle measured from perpendicular to Ao in a plane perpendicular to the array.

It is necessary to evaluate the peak radiation of the antenna itself. The method used is that outlined in Reference 8.

$$\text{Peak Antenna Radiation} = \int I(x)\ l(x)\,dx \tag{3}$$

where

$l(x)$ is the dimension of antenna, and

$I(x)$ is the aperture distribution.

Since $l(x)$ = constant,

$$\text{Peak Antenna Radiation} = l(x) \int I(x)\,dx$$

$$= 21.3 \int_{-42.5}^{42.5} \cos^2 \frac{x\pi}{85}\,dx = 905$$

arbitrary current units.

Now the magnitude of the current scattered from each individual rib is given by the product of the rib length, rib width, excitation and induced current ratio. The induced current ratio is a figure of merit for the rib which relates the current flowing in the rib to the current incident upon the rib. Graphs of the quantity as a function of rib size can be found in Reference 6. It shall be assumed, for the sake of simplicity, that the excitation of the ribs is uniform and equal to the excitation at the center of the rib. This excitation is determined by geometrically projecting the rib onto the antenna aperture and calculating the equivalent antenna current flowing in that strip using the assumed antenna distribution. The computation is then tabulated as follows:

Rib No.	×	length	×	width	×	excitation	×	induced current ratio	=	Total
a.		42.7		.118		.241		5.28	=	6.4115
b.		42.7		.118		1		5.28	=	26.6040
c.		42.7		.118		.241		5.28	=	6.4115
										39.4270

Using these values of scattered field and substituting in equation (2), the peaks of the scattered energy will have a value equal to the sum of the fields scattered from the individual radiators, or 39.43 arbitrary current units. Also, the peaks are found to occur approximately every four degrees from the axis of the array. These peaks are 26 db down from the peak antenna radiation as calculated from equation (3) and taking into account the 1 db loss in gain due to the radome. The peaks are all of the same magnitude since we have assumed a linear antenna made up of isotropic radiators spaced many wavelengths apart. The antenna pattern of this array has been plotted in Figure 12 as a function of relative power level below the antenna main beam.

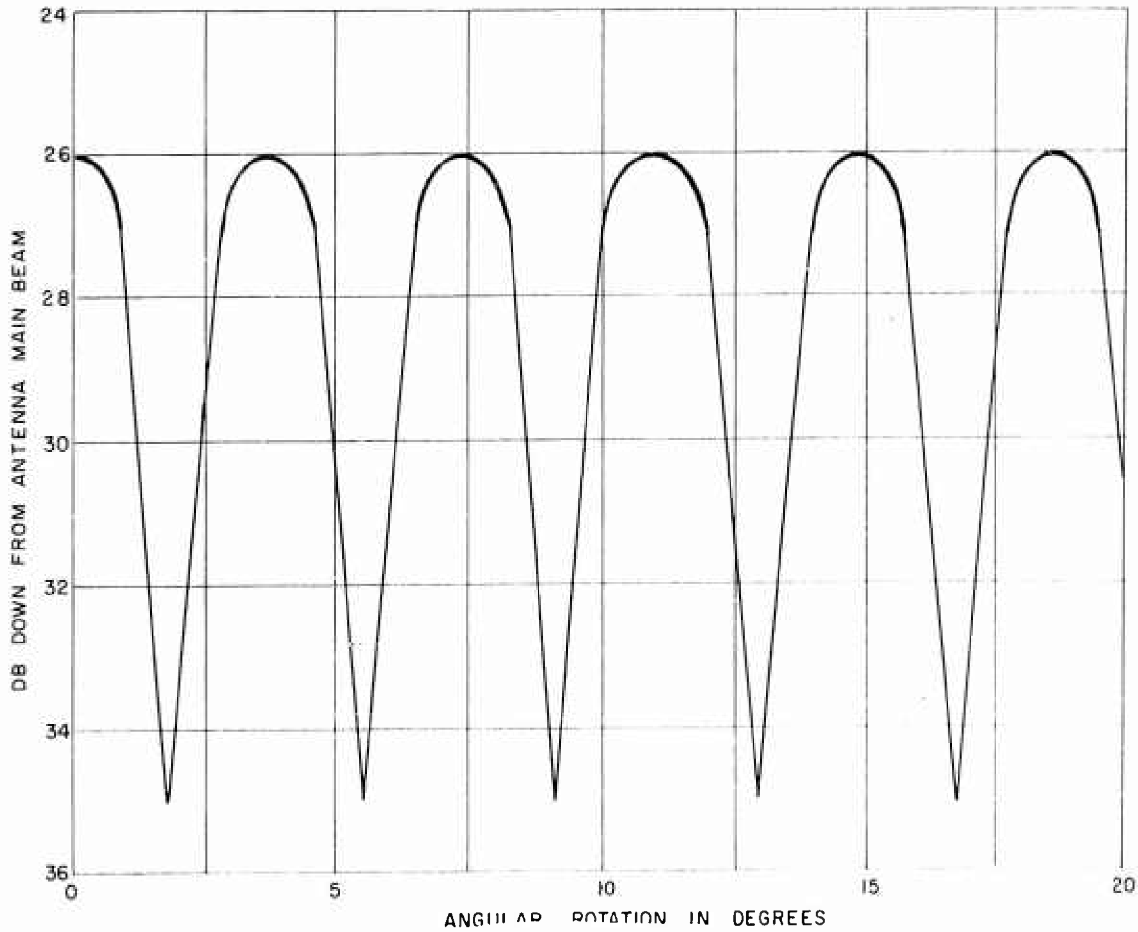


Figure 12. Antenna Pattern of Rib Array

It can be seen that these results correspond quite well with those obtained by the National Research Council in their tests. This calculation shows that the off-axis side lobes are indeed caused by this array of ribs and that one can predict the effect of such an array in a fairly straightforward manner.

CONCLUSIONS AND RECOMMENDATIONS

Since there are many relatively clear sites where no high angle clutter problems would exist, and since this clutter can be greatly reduced through the use of the systems STC

capability, the continued use of the CW-396A radome appears justified. However, the use of STC can only be considered an interim solution to the problem for the following reasons:

. the causative factor remains uncorrected, only the effects are reduced,

. a target with a small radar cross section could more easily penetrate a system that uses STC, and

. the presence of high, off-axis, side lobes contributed by the radome render the system more susceptible to jamming.

For search applications at L band frequencies, the CW-396A has proven satisfactory. At S band, however, it is evident for the reasons just stated that the CW-396A is unsatisfactory and its use with the AN/FPS-6 should be discontinued. A sandwich type radome, the CW-423, has proven to be an operationally adequate substitute for the CW-396A, however, the prohibitive costs incurred in the production of this radome do not render it a feasible substitute. A metal space frame radome design, which is currently being fabricated, will be tested to determine its suitability for use with the AN/FPS-6. In this new design, a considerably more random arrangement of radome rib geometry than that of the CW-396A is introduced to better distribute scattering contributions from the ribs.

The AN/FPS-6/CW-396A clutter problem illustrates some new points and emphasizes some old ones in designing and testing large rigid radomes, as follows:

. parallel arrays of radome ribs can have serious effects on antenna side lobe structure;

. off-axis side lobes should be carefully checked when testing a new antenna-radome combination; this check should be performed at all look angles for which the radome rib geometry differs significantly;

. suitability tests of the antenna-radome combination should include a test at a typical operational site wherever possible; and

. deleterious effects of parallel or quasi-parallel radome ribs can be analytically predicted in a straightforward manner.

REFERENCES

1. Lavrench, W., "Electrical Performance of Rigid Ground Radomes," *Transaction on Antennas and Propagation*, IRE, Volume AP-8, Number 6, p 548, Nov. 1960.
2. Handelsman, M., "Effect of Aperture Blocking on Antenna Patterns," RADC-Technical Note, 8 May 1956, (Informal Note).
3. "Effects of Radome Discontinuities on Antenna Patterns," Ohio State University, Antenna Laboratory, Rept No. 722-3, Contract AF30 (602)-1620, pp 38-41, 31 Aug 1957.
4. Curtis, R.B., and Vaccaro, J., "Survey of Ground Radomes," RADC-TR-61-52, May 1961, p 27.
5. Lavrench, W., "Results of Tests on the AN/FPS-6 Antenna under the CW-396A Radome," National Research Council of Canada, Rept No. ERB-585, May 1961.
6. Kennedy, Peter D., "An Analysis of the Electrical Characteristics of Structurally Supported Radomes," Ohio State University, Antenna Laboratory, Rept No. 722-8, Contract AF30 (602)-1620, pp 53-78, 15 Nov. 1958.
7. IBID Ref. 5.
8. IBID Ref. 5, pg 85.

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